General Application Name: Park Authority

Product / Service / Function Name: Site Location and Analysis

P/S/F Description:

As communities look to enhance the quality of services to provide its citizens, parks are often a top priority. To locate an area for a new park, officials must weight and consider several different factors, such as availability of land, zoning requirements, and current land use in order to narrow down the selection. As a part of the site location process, officials must determine what the primary use will be for the facility. This can help them analyze other types of data, such as demographics, to determine if there are enough potential visitors to the new recreation facility. Site selection and analysis are flagship functions of GIS. A GIS can be customized to automate the process that helps identify land that can be used for a potential park or recreational area. A GIS can also assist planners in analyzing data about existing recreational facilities, such as who is using it, at what times, and for what type of activities.

Product / Service / Function

1. Spatial Data

Minimum Data Requirements

General Description	GIS Data Layer
Parks and Recreation	Park Buildings (points or footprints)
	Park Boundaries
Planimetric/Base Map	Parcels
	Zoning
	Land Use
Natural Features	Land Cover
	Wetlands
	Soils
	Flood Plain
	Streams/Lakes
Imagery	Orthophotos
Community Data	Points of Interest
	Schools
Socio-Political	Municipal boundaries
	Zoning
	Land Use

Optional Data Requirements

General Description	GIS Data Layer
Demographics	Tract Boundaries
	Block Boundaries
Community Data	Community Economic/Development Plans
	School Service Areas and Facilities

	Neighborhoods & Subdivisions
	Historic Structures

2. Attribute Data

Minimum Attribute Requirements

GIS Data Layer	Attributes
Park Buildings	Address
	Parcel ID
	Name
	Activities
Park Boundaries	Park Name
	Acreage
	Recreational Activities Data
Parcels	ID
	Owner
	Address
	Availability
Demographics	Community Segments/Trends
	Population Projections
	Census Data
	School Enrollments
Points of Interest	Name and type

Optional Attribute Requirements

GIS Data Layer	Attributes
Recreational Activities Data	Activity codes
	Schedules
	Facility Use codes
	Requirements indices
	Type of events
	Historical Recreation Use/Programs
	Attendance records
	Demographics of attendees
	Contacts by type of activity
	Overall Annual Budgets
	Program Expenses
	Facility revenues and expenses
	Activity revenues and expenses
Demographics	Population projections
Schools	Enrollments
School Service Areas and Facilities	Number of students
	Demographics of students
	Facilities ID

| Zoning | *See Zoning topic* |

3. Data conflation Options (integrated with VBMP digital orthos)

    Data conflation is a process by which two digital data layers, usually of the same area at different points in time, or two different data layers of the same area, are geographically "corrected" through geometrical and rotational transformations so that the different layers can be overlaid on one another. Also called "rubber-sheeting," this process allows a technician to adjust the coordinates of all features on a data layer to provide a more accurate match between known locations and a few data points within the base data set. A good base layer to use for data conflation is the VBMP orthophotos since many features can be seen or interpreted. The need and processes for conflation varies between sets of data, users, and feature types. Any dataset that is updated independently by different departments can be consolidated through conflation. Within most local governments, individual departments are responsible for maintaining specific datasets within their expertise; therefore, conflation is not often necessary. Often, reprojecting the data into a different coordinate system will take care of the misalignment of different data sets. Most industry-standard GIS software has the ability to perform data conflation.

    In the case of parks and recreation infrastructure, is important to either capture or create the features in the same projection as the VBMP orthophotography or reproject it later to match the orthophotos. This ensures that when the locations are converted into a GIS data layer, the features will appear in the correct location on the orthophotos.

4. Data Acquisition Options

    There are three primary methods to collect spatial data for parks. These include the use of digital orthophotographs, the use of GPS field data collection, and data collection through custom facility survey/mapping efforts. Attribute data sources include any number of hard copy programs and records as well as electronic spreadsheets and data tables.

    The park locations themselves may be acquired from the municipal GIS dataset, if available. If these sources are not available, the options become cost driven. The most cost efficient way to acquire the location of parks is by "heads up digitizing" the boundaries through visual interpretation from the VBMP orthophotographs. The accuracy of the parks compilation from heads up digitizing is going to be less than the accuracy of the ortho, but if completed carefully, will provide a very useful parks layer. The VBMP orthophotographs will provide sufficient detail and resolution to capture many buildings, playing fields, trails and parking lots, and many above ground utilities. Additional spatial data can be collected by GPS field surveys. More accurate survey coordinate data is also possible from GPS units, but these units are more expensive, and require higher levels of training and proficiency. If using internal staff is not an option, a GPS consulting firm can be contracted to collect field data.

    Base mapping and planimetric data are typically generated at the county or city level. This data may be produced in-house or the project may be contracted out to a consulting firm. This data often includes tax parcels, zoning districts, land use, open water, right-of-ways, railroads, and buildings. Street centerline data layers of varying qualities can be obtained from a number of vendors. The market is relatively competitive, and prices will vary with quality of the data. Relevant vendors that provide this kind of spatial data on a regional and national scale include: NAVTECH <www.navtech.com>, GDT <www.geographic.com>, and TeleAtlas <www.teleatlas.com>.

Other spatial data layers can be obtained through the Internet from various government sources beginning with both State and Federal agencies. Municipal boundaries and similar layers can be obtained in digital format through the U.S. Census Bureau <www.census.gov>. Floodplains can be obtained through the FEMA Web site, which is <www.fema.gov>. The USGS <www.usgs.gov> is a good source of spatial information, and typically has data in many GIS formats and various scales.

5. GUI / programming options

There are a few options for creating a GIS-based park site location application. Two avenues within this development track are:

- Standard GIS desktop application that can be customized to the user's needs
- Hiring a consultant to develop a custom system from scratch

Using a standard GIS software package often requires a significant amount of training and customization. Whereas the initial cost may be lower, the time invested in learning these solutions may generally increase the overall expense of implementation. However, standard GIS software packages deliver more robust data integration, analysis, and cartographic capabilities than do other specialized commercial applications. They have a greater user support infrastructure that allows users to overcome problems quickly. Options for using an existing, industry-standard GIS software application that can be customized for park site location include those listed in the following table:

Standard GIS Software Vendors:

Vendor	Software	Web Address
ESRI	ArcView 3.x	www.esri.com
ESRI	ArcGIS 8.x	www.esri.com
MapInfo	Professional 7.0	www.mapinfo.com
Intergraph	GeoMedia 5.0	www.intergraph.com/gis
Auto Desk	Map 5.0	www.autodesk.com

A second option for developing and implementing a GIS-based park site location application is to contract with a consultant. This option makes certain that a product will fulfill a jurisdiction's requirements. A consultant will be able to develop an application that works with the wide range of hardware and software that are currently in use within local governments within Virginia. Also, training and follow-up user support is often provided at a much more substantial level than with other options.

An application to aid in site selection for a new park and analysis of existing facilities would need to have several types of functions available. For site selection, a process would need to be developed that contains the parameters required and the steps taken to achieve the selection. For instance, the site selection process may first find current vacant land, then select all the vacant land near neighborhoods that represent areas of growth. Next, select the areas that historically show the need for specialized activities and define the amount of land that is needed. This ultimately narrows down to parcels of vacant land that meet the new parks intended purpose. A GIS could also help the locality promote recreational activities by using demographic analysis and targeting certain segments of the population by recreation interest or distance to a facility.

6. Internet Functionality and options

The Internet has proven itself as a viable solution for local governments to centralize the maintenance and management of services and data. As more local governments are implementing Web-based solutions, they are finding that the Internet requires them to change the nature of an application or its usefulness. Through the flexibility of an Internet solution, software can be easily updated, and users gain greater accessibility to the applications and information they need for their specific tasks through simple, user-friendly interfaces.

An online interactive park site selection application may not be suitable as a public website. However, as a service to the community, the locality may wish to have an application that allows users to enter their address and the specific type of activity of interest and return a list of the possibilities that are close to their residence. This may help to increase the participation in recreational activities in the community. GIS software vendors have products that can be customized in-house or by a consultant to provide Web GIS applications on the Internet, over an intranet or via wireless network.

GIS Internet Solutions

Vendor	Internet Software	Web Address
ESRI	ArcIMS	www.esri.com/software/arcims
MapInfo	MapXtreme	www.mapinfo.com
Intergraph	GeoMedia WebMap	www.intergraph.com/gis/gmwm
AutoDesk	MapGuide	www.mapguide.com

7. Technical Requirements

Minimum Technical Requirements
At its most basic level, a GIS-based park site location application can be used on a single, stand-alone workstation. This workstation would have a hard drive that stores all of the spatial data layers, as well as the GIS software package or application itself. A typical workstation running off-the-shelf software should have the following minimum specifications:

Processor: Pentium 3; 450 MHz
RAM: 128MB SDRAM at 133MHz
Hard Disk: 20GB (min.)
Monitor 1:   19"
Floppy Drive: 3.5"
CD-ROM: 12x/8x/32x CD drive
Modem: 56K
OS: Windows 2000/NT/XP
Office: Windows 2000 Professional
Printer: 8x11 office-grade color printer

Optimum Technical Requirements:
A more complex system may require multiple components, including servers, desktop workstations, or ruggedized laptops, or handheld devices. For either a client-server or a Web-based application, the system should rely on a fairly robust server computer and high-end workstations. Some examples specifications of the necessary equipment are listed below:

Server

Processor:	Min. 2x Processors, 1.7 GHz, 512K cache
RAM:	Min. 2x 512MB RIMMS
Hard Disk:	Min. 2x 80GB +RAID
Monitor 1:	19"
Floppy Drive:	3.5"
CD-ROM:	12x/8x/32x CD drive
Modem:	56K
Network Card:	10/100 mbps

Workstation

Processor:	Pentium 4, 1.5 GHz
RAM:	512MB SDRAM at 133MHz
Hard Disk:	40GB
Monitor 1:	19"
Monitor 2:	17"
Floppy Drive:	3.5"
CD-ROM:	12x/8x/32x CD-RW drive
Modem:	56K
Network Card:	10/100 mbps
OS:	Windows 2000/NT/XP
Office:	Windows 2000 Professional

Other Components

Printer:	8x11 office-grade color printer and 8x11 production b/w printer
Plotter:	HP DesignJet 1055CM
Tape Backup:	Tape Library Server
UPS:	APC 1400 (or other similar)
Scanner:	11x17
Handheld:	Compaq IPAQ
Network:	T1

8. Administrative/Management Requirements

At the beginning of the project, the assigned project manager from the particular municipality should consider completing some, if not all of the following tasks that relate to the administrative requirements of a park site selection and analysis application:

- Determine, with or without the assistance of a consultant hired to develop the system, the preliminary vision and goals of the project.
- Coordinate an initial meeting with the decision-makers (i.e. the Board of Supervisors, City Council, parks and recreation department, planning department, etc.) where the vision and goals of the project are expressed and the background of GIS technology is described, if needed.
- Coordinate with other municipal agencies for data sharing provisions.
- Determine a mechanism of communication to keep the decision-makers aware of the progress of the project.
- Develop a basic understanding of the available precedents in the region/state and research the available technologies that can be applied to the project.

Upon project completion, a simple desktop application will require very little administrative support. Administrative tasks may include loading or upgrading new versions of the software or patches, providing for constant data flow from the source database, and maintaining yearly support contracts on the hardware and software. However, once the system becomes distributed as an enterprise solution to many users throughout a department or deployed on the Internet, there are various other management requirements that need to be fulfilled on a weekly or monthly basis.

At the point where the system grows beyond single desktop users, a devoted administrator or system manager needs to be established. This is essential for the following reasons:
- The system will now be interfacing with other technology systems already in place. Therefore, someone needs to maintain contact with the technology personnel that maintain these systems.
- The manager needs to put into place training schedules to maintain user knowledge of the system.
- Funding will undoubtedly be required to either maintain the system long-term, or continue to expand the system, which requires funding research and applications for grants.

9. Cost – Cost/Benefit

Hardware	Average Unit Cost
Minimum Workstation	$2,000
Optimum Workstation	$3,200
Laptop	$2,400
Web/FTP Server	$8,500
Database Server	$12,000
Data Warehouse Server	$18,000
Backup Server	$5,800
Printer (8x11 color)	$700
Printer (8x11 b/w production)	$2,000
Plotter	$12,000
Tape Library	$5,000
UPS (Universal Power Supply)	$700
Scanner	$1,500
Handheld	$300-$700
GPS equipment (for in-house work)	$5000-$15,000

Software (all prices included license)	Typical Unit Cost
Standard GIS desktop software	$700-$10,000
Customized desktop vendor solution	$5,000-$15,000
Web-based vendor application	$15,000-$25,000
Customized web-based vendor solution	$20,000-$60,000

Miscellaneous	Typical Unit Cost
GPS survey by a consultant	$15,000-$90,000 (depends on # features)
Training – per person	$700-$1,000

Training – general GIS	$700-$1,200
Licensing – desktop	$100-$500
Licensing – webapp (1st CPU)	$7,500-$12,000
Maintenance (per year)	$8,000-$15,000

10. Standards / Guidelines Summary

- Research the historical documentation; determine what data is available before establishing a budget.
- A GIS-based park site selection tool should be built so that non-technical personnel can be trained to use the system.
- Research and develop a site selection model before performing GIS analysis.
- Acquire input from all departments who will be involved in funding and/or utilizing the application before proceeding with the application design.
- Develop a detailed Quality Assurance/Quality Control (QA/QC) procedure for reviewing the accuracy of spatial data collection as well as for attributes.
- Maintain data in the VBMP standard coordinate system (Virginia State Plane, NAD 83, Survey Feet).
- Create metadata (standard information about GIS data) for each data layer. Metadata tracks the date, origin, coordinate system, and other such information for data layers.

11. Startup Procedures/Steps

There should be a minimum of eight steps involved with developing a GIS-based parks location and analysis application after funding is in place to support the project. The steps can be performed in-house or by a consulting team.

The first task is to complete a detailed Needs Assessment. This process gathers information regarding existing operational procedures, hardware and software, GIS data, and personnel needs. It should include interviews of key individuals throughout the local government agency and other related government departments to obtain a comprehensive view of the agency's operations, and where GIS might improve them. Basic GIS concepts should be discussed and illustrated to those interviewees that have little prior understanding of GIS. A comprehensive Needs Assessment should then be compiled from the results of the interviews. This document explains the various requirements for a GIS-based parks location and analysis application in the following areas: personnel needs, spatial data development needs, applicable spatial analysis techniques, basic system requirements, including preliminary, general hardware and software recommendations, and training needs.

The second task is to develop a functional requirements document for the proposed system. This document should describe, as completely as possible, all of the technology and functionality that is to be included in the application. This document is used by the local government agency, or its consultant, as the blueprint for the GIS application or system.

- Hardware specifications
- Software purchases
- Detailed descriptions of work-flow, and examples of the graphic user interfaces
- Describe each tool that is part of that graphic user interface, and its functionality
- Describe how data would flow between the different databases and data warehouses, if applicable

- Describe the redundant security measures that will be put in place to make certain of data integrity and confidentiality, when applicable
- Analytical techniques that the application/system provides
- Describe each of the potential products (reports, maps, charts, summary tables) that the user will be able to generate within the system

The third task should be to compile or develop spatial data that can be used by the evolving application. Data can be gathered from a number of online sources, as well as county/city departments. The data layers gathered and maintained should match at least the minimum list provided in Section 1 of this document and can be acquired through the methods described in Section 3 of this document.

On completion and acceptance of the functional requirements document and the development of the spatial and attribute data, the system development and test phase can begin. During this time, the application will be customized as it was outlined in the functional requirements phase.   The local government agency should require periodic reviews of the application at particular milestones, such as 50% and 75% completion. This will make certain that problems with the application will be recognized early in the development process, and that the local government agency remains a part of the development process throughout the project timeline.

When the application is nearing 100% completion, it should be installed and tested in the environment in which it will ultimately be used. This allows the users to test the system alongside the application developers, and determine any system integration problems that might arise. It also gives the developers the opportunity to test the application's functionality in a real-world situation. This testing process should be as comprehensive as possible. Each process detailed within the functional requirements should be tested and evaluated at this point.

User training commences once the application reaches 100% completion and is fully documented. Different levels of tutorials and system documentation should be developed depending on the hierarchy of users. Time should be spent at this stage of the project with each potential user of the system to make certain that the proper education occurs. Training should be done through lessons that use real-life examples of system application. This strategy greatly enhances users' ability to apply the functionality to their jobs.

The next phase of the project should include a document that describes a future plan for wider system development. This document accomplishes two goals. The future plan gives the local government agency ideas on how the system might grow to assist other facets of its business practices. Secondly, it provides the agency with a ready-made grant proposal for applying for potential funding sources.

The final phase of a successful implementation of a GIS-based parks location and analysis application is ongoing technical support. The local government agency should always include this contingency within its cost estimates of a project for a minimum of three months after a system has been put into place. No matter how effective an application appears problems and system changes inevitably impact the functionality of an application.

12. Estimated time line and/or implementation (stand alone) schedule

Phase	Approximate Duration
RFP/Contract process (construction, posting, proposal acceptance, review, award of contract)	4 months - 1 year
Needs Assessment	2 months
Functional Requirements	1-2 months
Data Development	6-12 months
System Development and Testing	2-4 months
Installation and Testing	1 month
User Training	½ month
Plan for Future Development	½ month
Ongoing Support	3 months

13. Best Practice Examples in Virginia